

CLAIMS

1. (I) In a vehicle having a right and left side and substantially massive components, and having at least one fixed body member connected with substantial rigidity to substantially all of the substantially massive components of said vehicle, a vehicle structure having an operating position attained during normal driving conditions and an extended position attained at the time of passenger and operator access to the vehicle, said vehicle structure having a means to divert the impact energy in lateral impacts to be absorbed by said vehicle through the at least one fixed body member while releasing the passengers and operators each having mass, weight, left and right sides, a back and a bottom, to move independently of said vehicle, in a passenger support mechanism with a plurality of elements in a predetermined controlled fashion, in order to minimize injury to such operators and passengers.

2.(D) The vehicle structure of claim 1, further comprising:

- a) at least one pair of secondary slides each with a first face and a second face, attached by said first face to the at least one fixed body member on the left side and the right side of the vehicle respectively, the members of each pair being mounted at the same longitudinal position of said vehicle;
- b) a plurality of passenger support mechanisms each having ejecting elements and non-ejecting elements and each of said passenger support mechanisms mounted in pairs on each of the left and the right sides of the said vehicle on at least one lateral axis;
- c) at least one pair of a safety beam lower element each member of said pair fixedly connected to said non-ejecting elements of the passenger support mechanisms, and each of said safety beam lower element having a first face and a second face, and said second face attached to the second face of said secondary slides such that, each of said safety beam lower element are normally fixedly attached by said second face to the second face of a member of said pair of secondary slide, but become decoupled and thereafter slidably attached by said second face to said secondary slides along a lateral axis when a lateral shear force greater than a predetermined force is applied to said first face relative to said second face of said secondary slides allowing said safety beam lower element attached to said second face of said secondary slides to slide along said lateral axis relative to said secondary slides, said safety beam lower element mounted on each of said secondary slides being constructed such that after they are decoupled, they can be guided laterally by, and are slidably attached to at least one member of a pair of said secondary slides and further positioned on the said secondary slides at all times such that they are not obstructed by any elements of the vehicle in the

event that said safety beam lower element need under collision conditions to traverse the center of the vehicle to the further side of the vehicle;

d) at least one pair of an safety beam upper element each member of said pair having a first face and a second face, and each of the members of said pair mounted with its first face to the first face of each member of said pair of said safety beam lower element on the left and the right sides of the vehicle, and fixedly attached by said second face to the ejecting elements of one of the passenger support mechanisms

e) at least one shock-absorbing device and at least one force distributing protector shield both installed to protect each of the pair of passenger support mechanisms, on each of the left and right sides of the vehicle, and locked to the fixed body members of the vehicle when in the operating position; and

f) internal airbags, each mounted on the outer side of each of said passenger support mechanisms, but inside said shock absorbers and protector shields, on both the left and the right sides of the vehicle, such that upon detection of an impact event, the airbag deploys next to said passenger support mechanism(s) and deploying upwards and inwards to protect the passengers.

3. The vehicle structure of claim 2, wherein said non-ejecting elements of said passenger support mechanisms comprise the inner arm rest and other elements of the passenger support mechanism supporting the passenger on the inner side of the vehicle and wherein said ejecting elements of said passenger support mechanisms comprise the outer arm rest and other elements of the passenger support mechanism supporting the passenger on the entry side of the vehicle.

4. The vehicle structure of claim 2, wherein said non-ejecting elements of said passenger support mechanisms consist of a null set of elements and the ejecting elements of the passenger support mechanism consist of all elements of the passenger support mechanisms.

5. (D) The vehicle structure of claim 2, wherein said internal airbags are preinflated to a predetermined pressure.

6. (D) The internal airbags of claim 5, further comprising supplementary porous filling materials within said internal airbags thereby changing the compression characteristics of said internal airbags under impact.

7. (I) A method of designing a passenger vehicle, comprising the sequence of:

a) designing a human environment that provides more than a minimal expected crash injury level, physical comfort and utility;

b) designing a vehicle that hosts said human environment to meet vehicle performance characteristics,

thereby providing a "bottom up" design paradigm that targets human safety and utility as a priority.

8. (I) A method for impact protection of passengers in a vehicle by minimizing the intrusion of the impacting body into the passenger space and minimizing the peak impact acceleration transferred to said vehicle.

9. (D) The vehicle structure of claim 2, wherein said ejecting elements comprise one or more of the elements of said passenger support mechanism that support the back, left side and right side of said passenger, said ejection providing a means for passenger egress and ingress.

10. (D) The vehicle structure of claim 9, wherein said ejection comprises, a downward movement.

11. (D) The vehicle structure of claim 9, wherein said ejection comprises, a rearward movement.

12. (D) The vehicle structure of claim 2, wherein said ejecting elements comprise one or more elements supporting the pelvis and upper legs of said passenger, said ejection providing a means for passenger egress and ingress.

13. (D) The vehicle structure of claim 12, wherein said ejection comprises, an upward movement.

14. (D) The vehicle structure of claim 12, wherein said ejection comprises, a forward movement.

15. (D) The vehicle structure of claim 2, wherein said ejecting elements comprise all support elements for the passenger, and wherein ejection raises the said ejected elements such that they can be subsequently be either translated or rotated over the sill of the vehicle side to allow egress and ingress of said passenger.

16.(D) The vehicle structure of claim 1, further comprising:

g) at least one pair of secondary slides each with a first face and a second face, attached by said first face to the at least one fixed body member on the left side and the right side of the vehicle respectively, the members of each pair being mounted at the same longitudinal position of said vehicle;

h) a plurality of passenger support mechanisms each having two interlocking parts consisting of an ejecting element that may be displaced to facilitate egress and ingress, and non-ejecting element and each of said passenger support mechanisms mounted in pairs on each of the left and the right sides of the said vehicle on at least one lateral axes said non-ejecting element of each passenger support mechanism, having a support face attached to the second face of said secondary slides such that, each of said non-ejecting elements of said passenger support mechanisms are normally fixedly attached by said support face to the second face of

1 a member of said pair of secondary slide, but become decoupled and thereafter slidably attached by said
2 support face to said secondary slides along a lateral axis when a lateral shear force greater than a
3 predetermined force is applied to said first face relative to said second face of said secondary slides allowing
4 said non-ejecting elements of said passenger support mechanism to detach from said secondary slides and
5 slide along said lateral axis relative to said secondary slides, said non-ejecting elements of the passenger
6 support mechanism mounted on each of said secondary slides being constructed such that after they are
7 decoupled, they can be guided laterally by, and are slidably attached to either member of a pair of said
8 secondary slides and further positioned on said secondary slides at all times such that they are not
9 obstructed by any elements of the vehicle in the event that said element of the passenger support mechanism
10 need under collision conditions to traverse the center of the vehicle to the further side of the vehicle, said
11 two interlocking parts of said passenger support mechaism being locked together while the vehicle is in
12 operation and unlocked for egress and ingress of the passenger;

- 13 i) at least one shock-absorbing device and at least one force distributing protector shield both installed to
14 protect each member of the pair of passenger support mechanisms, on each of the left and right sides of the
15 vehicle, said force distributing protector shield being pivotally mounted to the fixed members of the vehicle
16 and locked to the fixed body members of the vehicle when in the operating position; and
17 j) preinflated internal airbags with a first face and a second face, the first face mounted on the outer side of
18 each of the ejecting elements of the passenger support mechanism, and said second face attached to said
19 shock absorbers and protector shields, on both the left and the right sides of the vehicle, such that upon
20 detection of an impact event, the airbag deploys next to said passenger support mechanism(s) and
21 deploying upwards and inwards to protect the passengers.

22 17.(I)) In a vehicle having a vehicle structure comprising a right and a left side an independantly ejectable
23 mechanism for each of said passenger support mechanisms, wherein:

- 24 a) said independently ejectable mechanisms for the passenger support mechanisms on the left side of the
25 vehicle are mounted indirectly to fixed body members on the left side of said vehicle to allow said passenger
26 support mechanisms on the left side of the vehicle to eject by one of: sliding along a lateral axis to a position
27 substantially outside and adjoining the vehicle; rotating to face substantially outside the vehicle; extending
28 to face substantially outside the vehicle and moving outwards from the vehicle, to a position substantially
29 adjoining the vehicle on the left side thereby allowing said passengers that ride on said passenger support

mechanisms on the left side of said vehicle to egress and ingress from the left side of the vehicle by ejecting said independently ejectable mechanisms; and

b) said independently ejectable mechanisms for the passenger support mechanisms on the right side of the vehicle are mounted indirectly to fixed body members on the right side of said vehicle to allow said passenger support mechanisms on the right side of the vehicle to eject by one of: sliding along a lateral axis to a position substantially outside but adjoining the vehicle; rotating to face substantially outside the vehicle; extending to face substantially outside the vehicle and moving outwards from the vehicle, to a position substantially adjoining the vehicle on the right side thereby allowing said passengers that ride on said passenger support mechanisms on the right side of said vehicle to egress and ingress from the right side of the vehicle by ejecting said independently ejectable mechanisms.

18. (D) The vehicle structure of claim 17, wherein said passenger support mechanisms each further comprise a multi-element adjustable seat that provide a means for support to the body of said passenger and a removeable and lockable safety harness that is mounted with safety harness supports to said multi-element adjustable seat to deploy a surface that will protect and support predetermined parts of the human body when the vehicle sustains rapid changes in velocity, and wherein said safety harness supports are removable and lockable on at least one support point and pivotally supported on at least one support point to allow passenger to mount and dismount the said multi-element adjustable seat.

19.(D) The vehicle structure of claim 17, wherein said multi-element adjustable seat includes an adjustable section near the head and neck which supports said pivotally mounted safety harness supports, thereby allowing said safety harness to be released at the removable and lockable safety harness supports, to swing on said pivotally mounted safety harness supports, up and over the head of the passenger to allow the passenger access to said multi-element contoured seat.

20.(D) The vehicle structure as in claim 19, wherein said safety harness comprises:

a) a pair of harness support arms that are pivotally attached to the passenger support mechanism in the vicinity of the head rest on either side, said harness support arms being spring mounted to raise the harness when removed for egress and ingress;

b) telescoping sections with a first end and a second end, wherein said first end is attached to each of said harness support arms and with said second end attached to a protective shield that is designed to protect the head and neck under collision conditions;

c) harness lower sections that are attached to the lower end of said protective shield and lock into the inner sides of the arm rests or the sides of said passenger support mechanisms;

thereby providing a support surface under frontal impact for the head neck and torso, and providing easy access for egress and ingress when released from the locks at the harness lower section.

21.(D) The vehicle structure of claim 17, wherein said multi-element adjustable seat supports said pivotally mounted safety harness, and wherein said safety harness comprises driving controls mounted on its front surface away from the passenger.

22.(D) The vehicle structure of claim 17, wherein said ejectable multi-element adjustable seat comprises arm rests with operational controls for driving said vehicle.

23.(D) The vehicle structure of claim 1, further comprising:

a) at least one pair of a safety beam lower elements said pair comprising two members of said pair, each member of said pair having a first face and a second face, and constructed to provide a means to resist compressive lateral impact forces, and to provide support for components attached thereto, a member of each pair of said safety beam lower elements being directly mounted on its second face to the at least one fixed body member, such that said mounting of the two members of each pair are on each of the left side and on the right side respectively of said at least one fixed body member of the vehicle respectively, the members of each pair being mounted at the same longitudinal position of said vehicle;

b) at least one pair of a safety beam upper elements said pair comprising two members of said pair, each member of said pair having a first face and a second face and designed to resist compression, and each of the members of said pair mounted to the first face of each member of a pair of said safety beam lower element on the left and the right sides of the vehicle;

c) pairs of at least one passenger support mechanism each pair comprising two members, members of said pairs being mounted on each of the left and the right sides of said vehicle on at least one lateral axis such that the pair having its members closest to the external surface of the vehicle structure on any one of said lateral axes, constitutes the outermost pair on that lateral axis, and such that the pair having its members closest to the center of the vehicle structure on any one of said lateral axes constitutes an innermost pair;

d) a plurality of impact decoupler/secondary slides each with a first face and a second face, attached by said first face to one member of said pair of said safety beam upper element on the second face of said safety beam upper element and said impact decoupler/secondary slides fixedly attached by said second face to one of the passenger support mechanisms, such that said impact decouplers/secondary slides are normally fixedly attached

1 by said first face to said safety beam upper element, but become decoupled and thereafter slidably attached by
2 said first face to said safety beam upper element along a lateral axis when a lateral shear force greater than a
3 predetermined force is applied to said first face relative to said second face of said impact decouplers/secondary
4 slides allowing said passenger support mechanisms attached to said second face of said impact
5 decouplers/secondary slides to slide along said lateral axis relative to said safety beam upper element, said
6 impact decouplers/secondary slides mounted on each of said safety beam upper element being constructed such
7 that after they are decoupled, they can be guided laterally by, and are slidably attached to one or more of said
8 safety beam upper element mounted on a single pair of said safety beam lower element, and further positioned on
9 the safety beam upper element at all times such that they are not obstructed by any elements of the vehicle in the
10 event that said impact decouplers/secondary slides need under collision conditions to traverse the center of the
11 vehicle to the further side of the vehicle;

12 e) internal airbags, each mounted on the outer side of and adjoining each of the outermost said passenger
13 support mechanisms, on both the left and the right sides of the vehicle, such that upon detection of an impact
14 event, the airbag deploys one or more of upwards and inwards, next to said passenger support mechanism, to
15 protect the passenger; and

16 f) pairs of at least one protector assembly comprising a shock-absorbing device and a force distributing
17 protector shield, each of said pairs comprising two elements, said elements of each pair being mounted on the
18 left and the right side of the vehicle said protector assembly installed to protect each member of the outermost
19 pair of passenger support mechanisms, on each of the left and right sides of the vehicle, and locked to the fixed
20 body members of the vehicle to be oriented parallel to the sides of the passenger support mechanisms and
21 adjoining said internal airbags, when in the operating position and positioned so as to not interfere with ingress
22 and egress when said passenger support mechanisms are in the extended position.

24 24. (D) A vehicle structure as in claim 23, further comprising deflation devices that deflate said internal airbags
25 installed on the side of said vehicle away from said lateral impact, immediately following an impact, when an
26 outward movement of said passenger support mechanisms is detected, thereby providing more space for the
27 motion of said passenger support mechanisms following said impact and minimizing ejection of said passenger
28 support mechanism outside said vehicle.

31 31. The vehicle structure of claim 1, wherein said means to move independently of said
32 vehicle, said passenger support mechanism with a plurality of elements in a predetermined controlled fashion,
33 comprises at least one auxiliary brake with a first braking surface and a second braking surface, said first braking
34 surface being fixedly attached at and immediately following impact to said passenger support mechanism, and
35 said second braking surface being attached at and immediately following impact to said at least one fixed body
members of said vehicle.

32. (D) The vehicle structure of claim 23, wherein said internal airbags are preinflated to a predetermined pressure.

33. (D) The internal airbags of claim 23, further comprising supplementary porous filling materials within said internal airbags thereby changing the compression characteristics of said internal airbags under impact.

34. (D) The vehicle structure of claim 1, wherein said passenger support mechanisms comprise pressure memory capable materials on the surfaces that are in contact with passengers thereby enhancing the comfort and safety of passengers.

35.(D) The structure of claim 1, further comprising a safety foot switch fixedly attached to said passenger support mechanism, and positioned in the vicinity of said passenger's feet and programmed to controls the movement of the passenger support mechanism between said access position and said operating position, thereby providing passenger control of movement of said passenger support mechanism.

36. (D) A vehicle structure as in claim 23, further comprising shockabsorbing devices that are fixed to the safety beam upper element at one end and fixed to the locking devices that bind the safety beam upper element and the attached components to the at least one fixed body members of the vehicle when the vehicle is operational, thereby providing a means for the safety beam upper element to move in a controlled predetermined fashion outwards on the far side during a lateral impact, when the locking devices are secured.

37. (D) A vehicle structure as in claim 23, further comprising a flexible stretchable or folded material that is bound to the edges of the protector shield of the vehicle on one of its edges on such edges of protector shield that would normally make contact with the vehicle body, the other edge of the flexible stretchable or folded material is bound to a frame that locks to the vehicle body under operating conditions, thereby providing a membrane that can hold in body extremities preventing ejection on the far side under side impact, but also allowing storage of said material in a compressed or folded fashion under normal egress and

1 ingress beside the frame along with the protector shields with door impact decouplers that fracture or
2 disengage under impact.

3 38. (D) A vehicle structure as in claim 2, further comprising deflation devices that deflate said internal airbags
4 installed on the side of said vehicle away from said lateral impact, immediately following an impact, when an
5 outward movement of said passenger support mechanisms is detected, thereby providing more space for the
6 motion of said passenger support mechanisms following said impact and minimizing ejection of said passenger
7 support mechanism outside said vehicle.
